

IN THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A computer implemented diagnostic ~~tool~~ method for automatically diagnosing a system by:

determining a path in the ~~storage~~ system to test, wherein the path includes path components including at least a host adaptor, a link, a device interface, and a device, wherein the device comprises a storage system;

performing an initial test to determine if there is a failure in the path;

adding at least one of the path components to a suspect list capable of being a cause of the failure, wherein the suspect list is implemented in a computer readable data structure;

performing at least one isolation test on at least one of the path components added to the suspect list;

receiving input from a user indicating one or more storage areas to test in the storage system, wherein isolation tests on the storage system are performed with respect to those storage areas indicated by the user;

removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure; and

returning the suspect list to ~~the~~ the user to provide information on the path components capable of being the cause of the failure.

2. (Original) The method of claim 1, wherein the initial test comprises a test of the path, and wherein path components are added to the suspect list and isolation tested after the initial test indicates a path failure.

3. (Original) The method of claim 1, wherein the initial test comprises a test of the path, and wherein path components are added to the suspect list and isolation tested after the initial test indicates no path failure to provide additional testing of the path components.

4. (Previously presented) The method of claim 1, wherein isolation testing the host adaptor comprises: generating output to instruct the user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected, wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test.

5. (Previously presented) The method of claim 4, further comprising:
generating output to instruct the user to replace the link if the host adaptor passes the test;
performing a link isolation test on the path with a replacement link; and
removing path components from the suspect list if the link isolation test on the replaced link indicates that the link was one cause of the failure.

6. (Original) The method of claim 5, wherein if the link isolation test indicates that the link is not one cause of the failure, further performing:
removing the link from the suspect list;
generating output to instruct the user to reinstall the previously replaced link; and
performing a device interface isolation test of the device interface.

7. (Original) The method of claim 6, further comprising:
generating output to instruct the user to disconnect the device interface from the link to allow for isolation testing of the device interface.

8. (Original) The method of claim 6, wherein if the device interface isolation test indicates that the device interface is not one cause of the failure, further performing:
removing the device interface from the suspect list; and
performing a device isolation test of the device.

9. (Original) The method of claim 1, wherein performing the isolation testing of the host adaptor and device interface comprises additional isolation testing of field replaceable units within the host adaptor and device interface.

10. (Previously presented) The method of claim 1, further comprising:
determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through an initial link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch; and
performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch.

11. (Original) The method of claim 1, further comprising:
receiving input from the user indicating a level of testing, wherein the extent of the isolation tests are determined by the user indicated testing level.

12. (Canceled)

13. (Canceled)

14. (Currently amended) The method of claim ~~[[12]]~~ 1, wherein the storage system adheres to a Fibre Channel protocol and architecture and the link comprises an optical fiber wire.

15. (Original) The method of claim 1, wherein the system is capable of including different types of host adaptors and device interfaces, wherein there is a separate isolation test for each of the different types of host adaptors and device interfaces that are capable of being included in the system, and wherein performing an isolation test with respect to one host adaptor or device interface comprises:
determining a type of the host adaptor or device interface; and
performing the isolation test for the determined type of host adaptor or device interface.

16. (Currently amended) A system ~~for automatically diagnosing a storage system,~~
comprising:

(a) a storage system ~~includes~~ including a plurality of path components comprising:

(i) a host adaptor;

(ii) a link;

(iii) a device interface; and

(iv) a device, wherein the device comprises a second storage system, wherein the second storage system comprises storage areas;

(b) a processor;

(c) a computer readable medium accessible to the processor;

(d) a suspect list embedded in the computer readable medium; and

(e) a diagnostic software embedded in the computer readable medium capable of causing the processor to perform:

(i) performing an initial test to determine if there is a failure in the path;

(ii) adding at least one of the path components to ~~the~~ a suspect list capable of being a cause of the failure;

(iii) performing at least one isolation test on at least one of the path components added to the suspect list;

(iv) receiving input from a user indicating storage areas to test in the second storage system, wherein isolation tests on the second storage system are performed with respect to those storage areas indicated by the user;

~~[[iv]]~~ (v) removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure; and

~~[[v]]~~ (vi) returning the suspect list to ~~[[a]]~~ the user to provide information on the path components capable of being the cause of the failure.

17. (Original) The system of claim 16, wherein the initial test comprises a test of the path, and wherein path components are added to the suspect list and isolation tested after the first test indicates a path failure.

18. (Original) The system of claim 16, wherein the first test comprises a test of the path, and wherein path components are added to the suspect list and isolation tested after the first test indicates no path failure to provide additional testing of the path components.

19. (Previously presented) The system of claim 16, wherein isolation testing the host adaptor comprises:

generating output to instruct the user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected, wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test.

20. (Previously presented) The system of claim 19, wherein the diagnostic tool software is further capable of causing the processor to perform:

generating output to instruct the user to replace the link if the host adaptor passes the test;
performing a link isolation test on the path with a replacement link; and
removing path components from the suspect list if the link isolation test on the replaced link indicates that the link was one cause of the failure.

21. (Previously presented) The system of claim 20, wherein if the link isolation test indicates that the link is not one cause of the failure, then the diagnostic software is further capable of causing the processor to perform:

removing the link from the suspect list;
generating output to instruct the user to reinstall the previously replaced link; and
performing a device interface isolation test of the device interface.

22. (Previously presented) The system of claim 21, wherein the diagnostic tool software is further capable of causing the processor to perform:

generating output to instruct the user to disconnect the device interface from the link to allow for isolation testing of the device interface.

23. (Original) The system of claim 21, wherein if the device interface isolation test indicates that the device interface is not one cause of the failure, further performing:

removing the device interface from the suspect list; and
performing a device isolation test of the device.

24. (Original) The system of claim 16, wherein performing the isolation testing of the host adaptor and device interface comprises additional isolation testing of field replaceable units within the host adaptor and device interface.

25. (Previously presented) The system of claim 16, wherein the diagnostic software is further capable of causing the processor to perform:

determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through a first link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch; and

performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch.

26. (Previously presented) The system of claim 16, wherein the diagnostic software is further capable of causing the processor to perform:

receiving input from the user indicating a level of testing, wherein the extent of the isolation tests are determined by the user indicated testing level.

27. (Canceled)

28. (Canceled)

29. (Currently amended) The system of claim [[27]] 16, wherein the second storage system adheres to a Fibre Channel protocol and architecture and the link comprises an optical fiber wire.

30. (Original) The system of claim 16, wherein the system is capable of including different types of host adaptors and device interfaces, wherein there is a separate isolation test for each of the different types of host adaptors and device interfaces that are capable of being included in the system, and wherein performing an isolation test with respect to one host adaptor or device interface comprises:

determining a type of the host adaptor or device interface; and

performing the isolation test for the determined type of host adaptor or device interface.

31. (Currently amended) An article of manufacture for implementing a diagnostic tool for automatically diagnosing a system, wherein the diagnostic tool is embedded in a computer readable medium and includes code capable of causing a processor to perform:

determining a path in the storage system to test, wherein the path includes path components including at least a host adaptor, a link, a device interface, and a device, wherein the device comprises a storage system, wherein the storage system comprises storage areas;

performing an initial test to determine if there is a failure in the path;

adding at least one of the path components to a suspect list capable of being a cause of the failure, wherein the suspect list is implemented in a computer readable data structure;

performing at least one isolation test on at least one of the path components added to the suspect list;

receiving input from a user indicating storage areas to test in the storage system, wherein isolation tests on the storage system are performed with respect to those storage areas indicated by the user;

removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure; and

returning the suspect list to ~~[[a]]~~ the user to provide information on the path components capable of being the cause of the failure.

32. (Original) The article of manufacture of claim 31, wherein the initial test comprises a test of the path, and wherein path components are added to the suspect list and isolation tested after the initial test indicates a path failure.

33. (Original) The article of manufacture of claim 31, wherein the initial test comprises a test of the path, and wherein path components are added to the suspect list and isolation tested after the initial test indicates no path failure to provide additional testing of the path components.

34. (Previously presented) The article of manufacture of claim 31, wherein isolation testing the host adaptor comprises:

generating output to instruct the user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected, and wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test.

35. (Previously presented) The article of manufacture of claim 34, wherein the diagnostic tool code is further capable of causing the processor to perform:

generating output to instruct the user to replace the link if the host adaptor passes the test;

performing a link isolation test on the path with a replacement link; and

removing path components from the suspect list if the isolation test on the replaced link indicates that the link was one cause of the failure.

36. (Currently amended) The article of manufacture of claim ~~[[34]]~~ 35, wherein if the isolation test indicates that the link is not one cause of the failure, and wherein the diagnostic tool code is further capable of causing the processor to perform:

removing the link from the suspect list;
generating output to instruct the user to reinstall the previously replaced link; and
performing a device interface isolation test of the device interface.

37. (Original) The article of manufacture of claim 36, wherein the diagnostic tool code is further capable of causing the processor to perform:

generating output to instruct the user to disconnect the device interface from the link to allow for isolation testing of the device interface.

38. (Original) The article of manufacture of claim 36, wherein if the device interface isolation test indicates that the device interface is not one cause of the failure, further performing:

removing the device interface from the suspect list; and
performing a device isolation test of the device.

39. (Original) The article of manufacture of claim 31, wherein performing the isolation testing of the host adaptor and device interface comprises additional isolation testing of field replaceable units within the host adaptor and device interface.

40. (Previously presented) The article of manufacture of claim 31, wherein the diagnostic tool code is further capable of causing the processor to perform:

determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through an initial link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch; and

performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch.

41. (Original) The article of manufacture of claim 31, wherein the diagnostic tool code is further capable of causing the processor to perform:

receiving input from the user indicating a level of testing, wherein the extent of the isolation tests are determined by the user indicated testing level.

42. (Canceled)

43. (Canceled)

44. (Previously presented) The article of manufacture of claim 31, wherein the system is capable of including different types of host adaptors and device interfaces, wherein there is a separate isolation test for each of the different types of host adaptors and device interfaces that are capable of being included in the system, and wherein the diagnostic tool code is further capable of causing the processor to perform an isolation test with respect to one host adaptor or device interface comprising:

determining a type of the host adaptor or device interface; and
performing the isolation test for the determined type of host adaptor or device interface.

45. (Canceled)

46. (Canceled)

47. (Canceled)

48. (Canceled)

49. (New) A computer implemented diagnostic method for automatically diagnosing a system by:

determining a path in the system to test, wherein the path includes path components including at least a host adaptor, a link, a device interface, and a device;
performing an initial test to determine if there is a failure in the path;

adding at least one of the path components to a suspect list capable of being a cause of the failure, wherein the suspect list is implemented in a computer readable data structure;

performing at least one isolation test on at least one of the path components added to the suspect list, wherein isolation testing the host adaptor comprises generating output to instruct a user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected;

removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure, wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test; and

returning the suspect list to the user to provide information on the path components capable of being the cause of the failure.

50. (New) The method of claim 49, further comprising:

generating output to instruct the user to replace the link if the host adaptor passes the test;

performing a link isolation test on the path with a replacement link; and

removing path components from the suspect list if the link isolation test on the replaced link indicates that the link was one cause of the failure.

51. (New) The method of claim 50, wherein if the link isolation test indicates that the link is not one cause of the failure, further performing:

removing the link from the suspect list;

generating output to instruct the user to reinstall the previously replaced link; and

performing a device interface isolation test of the device interface.

52. (New) The method of claim 51, further comprising:

generating output to instruct the user to disconnect the device interface from the link to allow for isolation testing of the device interface.

53. (New) The method of claim 51, wherein if the device interface isolation test indicates that the device interface is not one cause of the failure, further performing:

removing the device interface from the suspect list; and
performing a device isolation test of the device.

54. (New) The method of claim 49, further comprising:

determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through an initial link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch; and

performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch.

55. (New) The method of claim 49, wherein the device comprises a storage system, wherein the storage system comprises storage areas, further comprising:

receiving input from the user indicating storage areas to test in the storage system, wherein isolation tests on the storage system are performed with respect to those storage areas indicated by the user.

56. (New) A computer implemented diagnostic method for automatically diagnosing a system by:

determining a path in the system to test, wherein the path includes path components including at least a host adaptor, a link, a device interface, and a device;

determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through an initial link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch;

performing an initial test to determine if there is a failure in the path;

adding at least one of the path components to a suspect list capable of being a cause of the failure, wherein the suspect list is implemented in a computer readable data structure;

performing at least one isolation test on at least one of the path components added to the suspect list;

performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch;

removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure; and

returning the suspect list to a user to provide information on the path components capable of being the cause of the failure.

57. (New) The method of claim 56, wherein isolation testing the host adaptor comprises: generating output to instruct the user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected, wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test.

58. (New) The method of claim 56, wherein the device comprises a storage system, wherein the storage system comprises storage areas, further comprising:

receiving input from the user indicating storage areas to test in the storage system, wherein isolation tests on the storage system are performed with respect to those storage areas indicated by the user.

59. (New) A system comprising:

(a) a storage system including a plurality of path components comprising:

- (i) a host adaptor;
- (ii) a link;
- (iii) a device interface; and
- (iv) a device; and

(b) a processor;

(c) a computer readable medium accessible to the processor;

(d) a suspect list embedded in the computer readable medium; and

(e) a diagnostic software embedded in the computer readable medium capable of causing the processor to perform:

- (i) performing an initial test to determine if there is a failure in the path;
- (ii) adding at least one of the path components to a suspect list capable of being a cause of the failure;
- (iii) performing at least one isolation test on at least one of the path components added to the suspect list;
- (iv) generating output to instruct a user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected;
- (v) removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure, wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test; and
- (vi) returning the suspect list to the user to provide information on the path components capable of being the cause of the failure.

60. (New) The system of claim 59, wherein the diagnostic software is further capable of causing the processor to perform:

- generating output to instruct the user to replace the link if the host adaptor passes the test;
- performing a link isolation test on the path with a replacement link; and
- removing path components from the suspect list if the link isolation test on the replaced link indicates that the link was one cause of the failure.

61. (New) The system of claim 60, wherein if the link isolation test indicates that the link is not one cause of the failure, then the diagnostic software is further capable of causing the processor to perform:

- removing the link from the suspect list;
- generating output to instruct the user to reinstall the previously replaced link; and
- performing a device interface isolation test of the device interface.

62. (New) The system of claim 61, wherein the diagnostic ~~tool~~ software is further capable of causing the processor to perform:

generating output to instruct the user to disconnect the device interface from the link to allow for isolation testing of the device interface.

63. (New) The system of claim 61, wherein if the device interface isolation test indicates that the device interface is not one cause of the failure, further performing:

removing the device interface from the suspect list; and
performing a device isolation test of the device.

64. (New) The system of claim 59, wherein the diagnostic software is further capable of causing the processor to perform:

determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through a first link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch; and

performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch.

65. (New) The system of claim 59, wherein the device comprises a second storage system, wherein the second storage system comprises storage areas, wherein the diagnostic software is further capable of causing the processor to perform:

receiving input from the user indicating storage areas to test in the second storage system, wherein isolation tests on the second storage system are performed with respect to those storage areas indicated by the user.

66. (New) A system comprising:

(a) a storage system including a plurality of path components comprising:

(i) a host adaptor;

- (ii) a link;
- (iii) a device interface; and
- (iv) a device; and
- (b) a processor;
- (c) a computer readable medium accessible to the processor;
- (d) a suspect list embedded in the computer readable medium; and
- (e) a diagnostic software embedded in the computer readable medium capable of causing the processor to perform:

- (i) determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through a first link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch;

- (ii) performing an initial test to determine if there is a failure in the path;

- (iii) adding at least one of the path components to a suspect list capable of being a cause of the failure;

- (iv) performing at least one isolation test on at least one of the path components added to the suspect list;

- (v) performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch;

- (vi) removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure; and

- (vii) returning the suspect list to a user to provide information on the path components capable of being the cause of the failure.

67. (New) The system of claim 66, wherein isolation testing the host adaptor comprises: generating output to instruct the user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected, wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test.

68. (New) The system of claim 66, wherein the device comprises a second storage system, wherein the second storage system comprises storage areas, wherein the diagnostic software is further capable of causing the processor to perform:

receiving input from the user indicating storage areas to test in the second storage system, wherein isolation tests on the second storage system are performed with respect to those storage areas indicated by the user.

69. (New) An article of manufacture for implementing a diagnostic tool for automatically diagnosing a system, wherein the diagnostic tool is embedded in a computer readable medium and includes code capable of causing a processor to perform:

determining a path in the system to test, wherein the path includes path components including at least a host adaptor, a link, a device interface, and a device;

performing an initial test to determine if there is a failure in the path;

adding at least one of the path components to a suspect list capable of being a cause of the failure, wherein the suspect list is implemented in a computer readable data structure;

performing at least one isolation test on at least one of the path components added to the suspect list;

generating output to instruct a user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected;

removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure, wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test; and

returning the suspect list to the user to provide information on the path components capable of being the cause of the failure.

70. (New) The article of manufacture of claim 69, wherein the diagnostic tool code is further capable of causing the processor to perform:

generating output to instruct the user to replace the link if the host adaptor passes the test;

performing a link isolation test on the path with a replacement link; and
removing path components from the suspect list if the isolation test on the replaced link indicates that the link was one cause of the failure.

71. (New) The article of manufacture of claim 70, wherein if the isolation test indicates that the link is not one cause of the failure, and wherein the diagnostic tool code is further capable of causing the processor to perform:

removing the link from the suspect list;
generating output to instruct the user to reinstall the previously replaced link; and
performing a device interface isolation test of the device interface.

72. (New) The article of manufacture of claim 71, wherein the diagnostic tool code is further capable of causing the processor to perform:

generating output to instruct the user to disconnect the device interface from the link to allow for isolation testing of the device interface.

73. (New) The article of manufacture of claim 71, wherein if the device interface isolation test indicates that the device interface is not one cause of the failure, further performing:

removing the device interface from the suspect list; and
performing a device isolation test of the device.

74. (New) The article of manufacture of claim 69, wherein the diagnostic tool code is further capable of causing the processor to perform:

determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through an initial link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch; and

performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch.

75. (New) The article of manufacture of claim 69, wherein the device comprises a storage system, wherein the storage system comprises storage areas, wherein the diagnostic tool code is further capable of causing the processor to perform:

receiving input from the user indicating storage areas to test in the storage system, wherein isolation tests on the storage system are performed with respect to those storage areas indicated by the user.

76. (New) An article of manufacture for implementing a diagnostic tool for automatically diagnosing a system, wherein the diagnostic tool is embedded in a computer readable medium and includes code capable of causing a processor to perform:

determining a path in the system to test, wherein the path includes path components including at least a host adaptor, a link, a device interface, and a device;

determining whether the path components include at least one switch, device port, initiator port, and links therebetween, wherein the host adaptor connects through an initial link to an initiator port on the switch and the device interface connects through a second link to a device port on the switch;

performing an initial test to determine if there is a failure in the path;

adding at least one of the path components to a suspect list capable of being a cause of the failure, wherein the suspect list is implemented in a computer readable data structure;

performing at least one isolation test on at least one of the path components added to the suspect list;

performing isolation testing on the switch, device port, initiator port, and the first and second links if the path includes the switch;

removing the tested path component from the suspect list if the isolation test confirms that the tested path component cannot be a source of the failure; and

returning the suspect list to a user to provide information on the path components capable of being the cause of the failure.

77. (New) The article of manufacture of claim 76, wherein isolation testing the host adaptor comprises:

generating output to instruct the user to disconnect the host adaptor from the link, wherein the isolation test is performed on the host adaptor after the user provides input indicating that the host adaptor was disconnected, and wherein the host adaptor is removed from the suspect list if the host adaptor passes a diagnostic test.

78. (New) The article of manufacture of claim 76, wherein the device comprises a storage system, wherein the storage system comprises storage areas, wherein the diagnostic tool code is further capable of causing the processor to perform:

receiving input from the user indicating storage areas to test in the storage system, wherein isolation tests on the storage system are performed with respect to those storage areas indicated by the user.